## Lava Beds National Monument

### **Teacher Information**

# Unit 4 Bats of Lava Beds

Bats are some of the most threatened animals on earth because of the rapid destruction of critical habitat and their slow rate of reproduction. Female bats mature slowly and, depending on the species, usually have only one young (pup) per year. Fourteen species of insect-eating bats live in and around Lava Beds National Monument. Some migrate here for the summer only, while others live here year-round. This region is one of the last strongholds in the western United States with relatively undisturbed habitat for these animals.

#### Lava Beds Bat List

Mexican Free-tailed Bat	Tadarida brasiliensis
Pallid Bat	Antrozous pallidus
Townsend's Big-eared Bat	Corynorhinus townsendii
Big Brown Bat	Eptesicus fuscus
Silver-haired Bat	Lasionycteris noctivagans
Hoary Bat	. Lasiurus cinereus
California Myotis	Myotis californicus
Western Small-footed Myotis	Myotis ciliolabrum
Long-eared Myotis	. Myotis evotis
Little Brown Myotis	. Myotis lucifugus
Fringed Myotis	. Myotis thysanodes
Long-legged Myotis	. Myotis volans
Yuma Myotis	Myotis yumanensis
Western Pipistrelle	. Pipistrellus hesperus

The Townsend's big-eared bat (*Corynorhinus townsendii*) forages almost exclusively in lava tube collapses and over the shrubby vegetation in the interior of the park, feeding on night-flying moths. Mexican free-tailed bats (*Tadarida brasiliensis*) feed on vast quantities of smaller flying insects as well as pests that damage agricultural crops in the Tulelake Basin. All bats must find a source of water and usually drink in flight. At Lava Beds, there is no surface water which is why caves which collect water are so important to animals. Caves with ice are heavily used by bats as well as many other animals. Heppe Cave is one such cave, that typically has several pools of water formed by melting ice.



Heppe "ice" cave

#### Where do bats live in Lava Beds National Monument?

Lava tube caves are a major source of shelter for bats in Lava Beds National Monument throughout the year. Some species utilize caves for hibernation in the winter and/or for raising their young during the summer. Lava Beds has the greatest concentration of lava tube caves in the continental United States. Over 750 caves have been discovered so far! The sheer number of caves and the different locations and temperatures of caves at Lava Beds make them excellent habitats for more than a dozen species of insect-eating bats, both migratory and hibernators.

Lava tube caves are created by flowing lava. After the lava cools, a long underground cave is formed. The ceilings of some of these caves have collapsed forming plenty of openings for bats to enter.

#### **Hibernation or Migration?**

Since all bats in Lava Beds National Monument eat insects, they must either migrate or hibernate to survive the winter because insects are not a readily available food source during this time of year.

In summer, colonies of tens, or even hundreds, of thousands of Mexican free-tailed mother bats migrate from Mexico to give birth and raise their young in Lava Beds' caves. These groups of females are called maternity colonies. Young, hairless bats need to be raised in warm temperatures, so mother bats leave their babies crammed together—as many as 100 per square foot—on the domed ceilings of caves. [How many students could you cram into a ten foot square area?] Lava Beds is one of the farthest north places with favorable shelter for maternal colonies of the Mexican Free-tailed bat. Bats usually migrate in September or October when the population of insects begins



Mexican Free Tailed Bat amidst many young by Merlin Tuttle

to drop. Bats born at Lava Beds' make this journey of hundreds of miles for the first time when they are only four or five months old.

Instead of flying south to Mexico to places warm enough to have an insect population throughout the winter, some species of bats go into hibernation. Lava Beds provides year-round shelter for these hibernating bats. Bats, such as the federally threatened Townsend's Big-eared bat, search out colder caves than the ones they use in summer in order to shut down their metabolism and survive through the winter. They will come out of hibernation in late April or early May as the temperature begins to warm.

#### Why have cave closures?

If you visit Lava Beds you may see caves that are closed to visitors; this is to protect the bats living in those caves. Hibernating bats that are disturbed by humans have to warm up their bodies in order to respond, this uses valuable body fat reserves and eventually the bat can starve to death. Closing caves with hibernating bats in the winter helps prevent the deaths of bats. In the winter Townsend Big-eared Bats hibernate in some of the caves on cave loop, such as Sunshine Cave.

In the summer cave closures are also important since these caves are critical habitat for maternal colonies of Mexican Free-tailed bats. Mother bats in maternity colonies have been known to

abandon their pups when disturbed by people. Abandonment usually means the pup will die. So, in summary, human disturbance of hibernacula and maternity colonies effects bat populations; this is why it is so important to follow cave closures.

#### What are bat counts? How do they help the bats of Lava Beds?

Because bats are such a critical component of ecosystems in Lava Beds, the Townsend's bigeared bat and the Mexican free-tailed bat are being closely studied by the Monument's resource management staff. Changes in the populations of these bats are monitored to learn more about their reproductive behavior. Studying these bats provides valuable information about conditions in the caves and surrounding ecosystems. This information allows staff members to understand what conditions are like for other species of bats in the area.

One method used to count bats at Lava Beds National Monument is to count each bat as it is seen by a staff member. Since bat colonies in Lava Beds do not number in the millions it is possible to count them individually by sight. When natural resources staff members count bats they take two hand-held counters. Each time a bat flies out of the cave they click one counter and when a bat flies back into the cave the staff member clicks the other counter. This only works with some caves; if a cave has multiple entrances it is nearly impossible for the staff at Lava Beds to count all the bats.

The data collected is used to determine if the population is increasing, decreasing or remaining about the same. If there was a major decline in the number of bats, natural resources staff would further investigate the reasons for the decline and possibly work to prevent this in the future.

#### **Are Population Estimates Always Correct?**

There are different ways of estimating populations of bats. The sight method of counting bats, described above, can be used for smaller populations of bats, but, what about populations like the one at Bracken Cave in Texas? There are over 20 million bats! Or are there?

Bracken Cave and Carlsbad Cavern are both famous for high concentrations of bats. Carlsbad Cavern was estimated to have 20 million bats in 1936 and Bracken Cave around 9 million. In 1937 qualitative visual estimates were made by observing a column of emerging bats (an out flight) and estimating the number of bats per unit volume (the density of the bat column). When combined with exit speed of an individual bat and the time period it took bats to fly out of the cave, estimates of bat colonies were made.

When estimates were made more recently, newer more accurate technology was available making population estimates seemingly crash! What could the reason for this impression of a population crash be? Plausible explanation are overestimation of population or a population shift and actual declines

It is likely that rapidly undulating columns of bats swiftly exiting the cave caused an overestimation in the density of the bat column. Another likely cause for the population crash is DDT a organochlorine insecticide created in 1939; known best for its ability to make egg shells crack under the weight of the adult bird. It is possible that the toxicity of DDT lead to declines in bat populations. DDT was extensively applied to crops until 1972; when it was banned in the United States.

#### What threatens bats in Lava Beds National Monument?

The biggest threat to bats in Lava Beds is human interference. If you see a bat while in Lava Beds you should be quiet, shine your flashlight away from the bat, talk quietly (don't whisper)

and leave the area. If you do these things you will help the bat survive.

One newly discovered threat to bats was discovered in the northeastern United States. A fungus is estimated to have caused the deaths of over a million bats thus far! A large percentage of the total known bat deaths were the endangered Indiana bat. Some scientists think that white-nose syndrome (WNS) is a sickness caused by this newto-science fungus, however, more research is needed. Scientists have reason to believe that the disease is unintentionally transmitted from bat to bat and carried from one cave to another by humans on items such as hair, skin, clothing and equipment used for caving. This idea is supported by the fact that many inaccessible and non-popular caves have not been affected by WNS while those that are visited on a regular basis by people are affected.

Areas such as Great Smoky Mountains National Park have closed all of their caves to the public. Smokies biologist Bill Stiver states: "We are closing all our caves to reduce the odds of the fungus hitching a ride to our protected caves on a caver from a state where it is already established".

Consensus Statement of the Second WNS Emergency Science Strategy Meeting Austin, Texas May 27-28, 2009 "Since [White-Nose Syndrome (WNS)] was first discovered in 2006, WNS has infected six species of ... bats in the ... U.S. ... estimated losses have exceeded one million bats over the past three years. ... Further losses could lead to the extinction of entire species ... Such losses alone are expected to have unprecedented consequences on ecosystem health throughout North America, with unknown economic consequences. Most bat species in North America feed on night-flying insects, of which many are pests of forests, agriculture, and garden crops or pose risks to human health. The number of insects consumed annually by one million bats is staggering—equivalent to 694 tons—emphasizing the extraordinary value of these bats to the normal function of both terrestrial and aquatic ecosystems. Establishment of a national comprehensive research program is urgently needed to identify underlying mechanisms causing WNS and to

develop sound management solutions."

Lava Beds National Monument has not yet had a reported case of WSR within the park, therefore, taking extremes measures such as closing caves are deemed unreasonable. However, the natural resources staff has been taking steps to prevent the spread of white-nose syndrome from cavers coming from the eastern states, by creating information displays that explain the illness and why they should not use gear they have used in eastern caves.

#### For More Information

White Nose Syndrome www.fws.gov/northeast/white\_nose.html http://www.batcon.org/index.php/what-we-do/white-nose-syndrome.html

Lava Beds Townsend's Big-eared Bats http://www.nature.nps.gov/ParkScience/index.cfm?ArticleID=114&Page=1

Bat Population Estimates www.mammalogy.org

Journal of Mammalogy, 89(1):18-24, 2008

http://www.asmjournals.org/perlserv/?request=get-document&doi=10.1644%2F07-MAMM-A-011.